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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,947	09/22/2003	Jonah A. Harley	10010746-1	5721

7590 03/12/2007

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EXAMINER	
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ART UNIT	PAPER NUMBER
2834	

MAIL DATE	DELIVERY MODE
03/12/2007	PAPER

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/664,947
Filing Date: September 22, 2003
Appellants: HARLEY ET AL.

Aldo Noto

For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 2/13/2006 appealing from the Office action mailed 8/16/2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

Patent	Inventor	Publication Date
JP 07-274540	Higuchi	10/20/1995
US 5,869,916	Suzuki	02/09/1999
JP 08-186,987	Suzuki	07/16/1996
US 5,986,381	Hoen et al.	11/16/1999
JP 04-271284	Nishiguchi	09/28/1992
US 6,472,795	Hirose et al.	10/29/2002

A translation of Nishiguchi is provided herewith.

(9) Grounds of Rejection

The following grounds of rejection are applicable to the appealed claims:

1. Claims 1, 3-7, 9, 14-17, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higuchi et al. (Higuchi)(JP 07-274540), in further view of Suzuki et al. (Suzuki-916)(US 5869916). Higuchi teaches a comb actuator (figure 2) having opposing combs 100 and 200 with electrodes on the surface of the combs (covered with insulation 321, 322 for protection). The electrodes forming repeating arrays of U, V, and W electrodes which receive power from conductors. The stationary teeth 110, 111 (first and third member) being opposed to a third tooth teeth 201 (second member), with electrodes mounted on the surface of the tooth (see figure 3) with an alternating voltage pattern applied to the electrodes. Higuchi teaches every aspect of the invention, as discussed above, except the discrete voltage patterns and intermediate voltages.

Suzuki-916 teaches an DC (discrete) driving voltages and intermediate driving voltage to smooth the movement of the mover (see figure 9). It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the actuator of Higuchi with the intermediate driving voltages of Suzuki-916 to provide a smooth movement of the mover.

2. Claims 8, 10-12, and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higuchi et al. (Higuchi)(JP 07-274540) and Suzuki et al. (Suzuki-916)(US 5869916), in further view of Suzuki et al. (Suzuki-987)(JP 08-186,987). Higuchi teach every aspect of the invention, as discussed above, except each second conductor connected to every other second electrode or the stator electrode connected to every other electrode, the first and second electrodes having different pitches/electrodes per distance (see figure 2), or the first electrodes are set high and low while the other electrodes are changing from low to high and high to low (see figure 3). Suzuki-987 teaches each first or second conductor connected to every other second electrode to provide enhanced driving force. Suzuki-987 teaches the equivalence to the electrodes driven by a two phase or three phase source. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the actuator of Higuchi and Suzuki 916 with the conductors connected as every other or every three and driven with the DC voltage pulses to provided enhanced driving force, as taught by Suzuki 987.

3. Claims 13 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higuchi et al. (Higuchi)(JP 07-274540) and Suzuki et al. (Suzuki-916)(US 5869916), in further view of Hoen et al. (Hoen)(US 5986381). Higuchi and Suzuki teach every aspect of the invention, as discussed above, except suspension compliant in one direction and stiff orthogonal to the direction of travel. Hoen teaches flexure suspension compliant in one direction and stiff orthogonal to the direction of travel are commonly used for MEMS actuators. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the actuator of Higuchi with the flexure suspension to provide an appropriate range of motion for the linear electrostatic actuator.

(10) Response to Argument

A. Higuchi and Suzuki – No suggestion to combine

Appellant's argument that Higuchi and Suzuki are not desirable to be combined because Higuchi is an electrostatic actuator driven by AC voltages and Suzuki is an electrostatic actuator driven by DC voltages is not persuasive. Higuchi discloses the short comings force and weight in the prior art magnetic actuators (See paragraphs 0002 and 0003 of the translation of Higuchi), which are overcome by electrostatic actuators. Higuchi discloses the invention is an improvement to AC electrostatic actuators directed to the positioning of the electrodes in the actuator to improve the stresses and force density of a three or four phase actuator. While Higuchi discloses an AC driving force, the mechanical positioning of the electrodes in a three or four phase actuator creates the improved stress resistance, the force density (See paragraph 0013

of Higuchi) and the electrode arrangement provides a thin compact electrostatic motor (paragraph 0020 and 0021 of Higuchi). These improvements are beneficial to both AC and DC driven actuators. Higuchi goes on to suggest, in paragraph 0038 that the improvement in the electrodes of the stator and the moving element and the layered structure of the insulation is not limited to the practical example provided in Higuchi. Particularly, the number of phases and the AC voltage can be changed in various ways. Suzuki is combined to shown a known way of driving an AC electrostatic actuator is with a DC Voltage to provide five types of combinations in polarities and voltages to control the movement of the mover left and right in a smooth movement (col. 10, lines 37-58, particularly line 51). The combined teaches of Higuchi and Suzuki teach an electrostatic actuator with improved stress resistance, force density, compact, and thin, which is also provides a smooth movement of the mover as suggested by Higuchi (paragraph 0038), and taught by Suzuki (col. 10, line 51). The combination is supported by Hoen et al. (US 5986381) (col. 20, lines 20- 25: "while the invention has been described with DC voltage levels applied to the electrodes, this is not critical. All the basin operational functions of the actuator can be provided with a.c. voltages applied to the electrodes) and Hirose et al. (US 6472795) which teaches that electrostatic actuators can be driven by alternating or discrete voltage patterns (see figures 6a or 6b)(col. 4, lines 8-11: The voltages applied to the drive electrodes groups 109a through 109c are made to have a waveform that changes with time, such as a rectangular waveform as shown in (a) through (c) of Figure 6A **or**, a 2-phase AC wave shown in (a) through (c) of Figure 6B); and Nishiguchi et al. (JP 4-271,284) which teaches that

discrete voltage patterns allow precise control of the mover, as set forth in the Final Office Action dated 08/16/2005. Nishiguchi et al. (JP 4-271,284) teaching that various application patterns are possible (paragraph 0020), including the DC voltage of Figures 6, 8, 9, of embodiments 1-3 and the sinusoidal voltage (AC) of figure 10 embodiment number 4 (paragraph 0024). Appellant's opinion regarding the combination of AC and DC electrostatic actuators is not supported by the references above. Particularly the secondary reference Suzuki, figure 3 where the U and V phase electrodes are driven by an AC (alternating current), which is provided by a DC source 25.

The Appellant's argument that the combination of Higuchi and Suzuki would render the invention unsatisfactory for the intended purpose is not persuasive. The intended purpose of Higuchi is to reduce stress and increase force density with a compact design. These purposes are achieved whether the traveling wave set up in the electrodes is established by a DC or an AC source. Appellant's argument that the proposed combination would change the principle of operation is not persuasive. Higuchi and Suzuki are both electrostatic actuators, whose basis of operation is Coulombs Law. The rejection is proper and should be maintained.

B. Higuchi and Suzuki – No motivation to combine

Appellant's argument that there is no motivation to combine Higuchi and Suzuki is not persuasive. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so

found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Suzuki provides literal motivation to combine the references on col. 10, lines 37-58, particularly line 51, where the DC Voltage to provide five types of combinations in polarities and voltages to control the movement of the mover left and right in a smooth movement. Additionally Higuchi provides literal motivation to combine the with Suzuki because it teaches the improvement of the reduced stress, improved force density, and compact arrangement are structural improvements to the electrostatic actuator which are not tied to the driving waveform (see translation paragraph 0038). The rejection is proper and should be maintained.

No support for Smooth Movement in the References Themselves

Appellant's argument that Suzuki cannot be combined with Higuchi because Higuchi does not discuss the smoothness is not persuasive. The Appellant cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In the instant case, the combined teaching of Higuchi and Suzuki teach an electrostatic actuator with a compact, low stress, high force density actuator of Higuchi that is driven with an alternating current established from a DC source with discrete voltage levels (shown in figure 9 and set forth in the Final Office Action dated 8/16/2005) to provide smooth motion to the mover. The Applicant's argument that there is no support for the

combination is not provided because it is literally provided in the references themselves as set forth in the preceding sections.

The Appellant's argument that Higuchi already provides smooth movement is not persuasive. Higuchi teaches that the current is alternating, but does not limit the alternating current to a smooth sine wave pattern. Higuchi specifically points out that the low stress and high force density comes from the structure, not the waveform in paragraph 0038 ("Moreover, the number of phases supplied to the electrodes and the alternating current waveform may be changed in various ways.) Suzuki is merely showing a way to provide the alternating current waveform which provides smooth movement. Appellant's argument regarding the AC waveform in Suzuki figure 27 is not persuasive. Suzuki provides an AC waveform with smooth movement and discrete steps as shown in figure 9. Figure 27 is a smooth movement actuator without discrete steps at the cost of a more complex control circuit. The rejection is proper and should be maintained.

C. Higuchi and Suzuki and Suzuki

Appellant's argument that claims 8, 10-12, and 18-21 are allowable because Higuchi cannot be combined with Suzuki is not persuasive for the reasons set forth above. Appellant's argument that Suzuki 987 cannot be combined with Higuchi because Higuchi teaches AC voltages which cannot be replaced with a DC source of Suzuki 987, is not persuasive for the same reasons as the combination with Suzuki 916 as set forth above. Additionally, the combination is supported by Hoen et al. (US 5986381)(col. 20, lines 20-25), Hirose et al. (US 6472795)(col. 4, lines 8-11 and figures

6a, 6b), and Nishiguchi et al. (JP 4-271,284)(translation paragraph 0020-0024, figures 6-10) all teaching that electrostatic actuators can be driven by alternating or discrete voltage, as set forth in the Final Office Action dated 08/16/2005 and Section A above. The rejection is proper and should be maintained.

D. Higuchi and Suzuki and Hoen

Appellant's argument that claims 13 and 24 are allowable because Higuchi cannot be combined with Suzuki is not persuasive for the reasons set forth above. Applicant's arguments that the flexure support of Hoen does not apply to Higuchi because Hoen is a MEMS device is not persuasive because both Higuchi and Hoen are linear electrostatic actuators where the driving forces will create out of plane forces, as taught and corrected by the flexures of Hoen. The rejection is proper and should be maintained.

(11) Related Proceedings Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

KARL TAMAI
PRIMARY EXAMINER

Karl I.E. Tamai

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